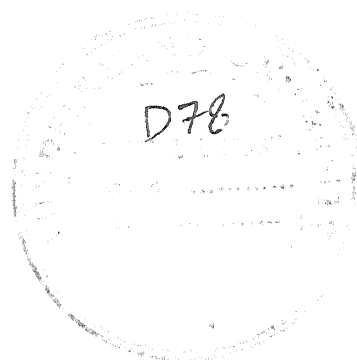


**SIMPLE CLEANING vs BETADINE-NEOSPORINE  
DRESSINGS IN CASES OF NEGLECTED BURN-  
A COMPARATIVE STUDY.,**

**THESIS**  
FOR  
**MASTER OF SURGERY**  
( GENERAL SURGERY )



**BUNDELKHAND UNIVERSITY  
JHANSI (U. P.)**


DEPARTMENT OF SURGERY,  
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C E R T I F I C A T E

Certified that the work entitled  
"SIMPLE CLEANING VS BETADINE-NEOSPORINE DRESSINGS IN  
CASES OF NEGLECTED BURN - A COMPARATIVE STUDY", has  
been carried out by Dr. SANJEEV MANGLIK himself in  
this Department.

He has put in the necessary stay in the  
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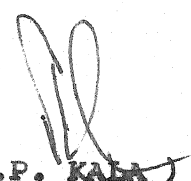
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CASES OF NEGLECTED BURN - A COMPARATIVE STUDY", has  
been carried out by DR. SANJEEV MANGLIK, under my  
constant supervision and guidance. The results and  
observations were checked and verified by me from  
time to time.

This thesis fulfils the basic ordinances  
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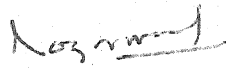
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C E R T I F I C A T E

This is to certify that Dr. SANJEEV MANGLIK  
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### ACKNOWLEDGEMENTS

Words are sometimes hard to find when you are trying to say thanks for something so priceless as loving criticism, considerate helpfulness and valuable guidance. Gratitude and sincerity resemble a spice too much to repel you and too little leave you wanting. Yet, facts must be evidently acknowledged and honest thankfulness unequivocally stated. This is what I have humbly attempted to do here.

I acknowledge with sincere thanks, the affectionate nature, heartening words and constant encouragement of Dr. R.P. Kala, M.S., Associate Professor in the Department of Surgery, M.L.B. Medical College, Jhansi, which has provided me the confidence and enthusiasm so essentially vital for successful accomplishment of such a project. His constant and meticulous supervision of every minute detail, constructive and valuable criticism and efficient & unfainting beneficance throughout this study have made this travail delightful and possible for me.

I owe a great debt of gratitude to Dr. S.L. Agarwal, M.S., F.R.C.S., Professor & Head of the Department of Surgery, M.L.B. Medical College, Jhansi, who for almost

whole year gave me encouragement, concrete suggestions and close supervision.

I express my deepest gratitude to Dr. R.K. Agarwal, M.D., Associate Professor & Head, Department of Microbiology, M.L.B. Medical College, Jhansi, for his excellent guidance, constant supervision and unlimited help at every step of this work.

I am sincerely thankful to Dr. Sanjay Lakhtakia, for his excellent help and co-operation at every stage of this work.

I fail in my duty if I do not appreciate and thanks to my best friend Dr. Praveen Jain. I am also thankful to Dr. Vipin Goel & Vivek Paliwal, for keeping my spirit high at every step.

I am specially thankful to Mr. K.M. Thomas for bringing out the work in representable form by his excellent ability of preparing type-script.

Lastly, I am highly obliged to those unfortunate burned patients, who became the subjects of this work.

Dated :

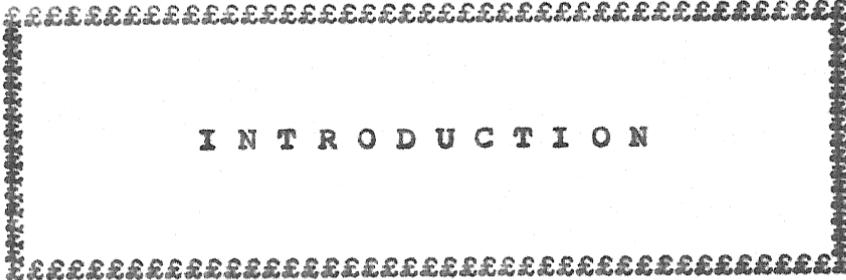
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I N T R O D U C T I O N

## INTRODUCTION

Thermal injury, a serious medical, social and economic problem is known to claim approximately one lac, ten thousand lives every year in our nation (Sinha et al, 1968). Man has been plagued by thermal injuries ever since he learnt to, and began, using fire. In our own hospital, as the records suggest, admissions on account of thermal injuries have continued to be on the rise with a mortality rate of about 37% in one single year, a fact resulting from the consequences of these burns - medical, social and economic. Progressive industrialisation has led to increased frequency of burns from chemicals, electricity and radiation etc. Roughly speaking, a single human is afflicted with burns each minute with its antecedent complications to follow.

The consequences of burns are complex, the treatment is costly and requiring great skill, patience as well as team effort. Prolonged hospitalisation is often necessary to even prevent the threat that these kinds of injuries pose to life the affected individual owing to the immediate and delayed complications. Reconstructive procedures and therapeutic, vocational and social rehabilitation may last for many months before

the patient is able to return to an active normal life. The well known therapeutic problems posed by burns include shock, pain, infection - local and systemic, denuded burn areas and deformities. Burns tend to result in wide raw areas and coverage of these areas remains an inseparable part of the management till date. In the early 19th century, the thought of autogenous skin grafting to cover the raw skin areas came into use. This was established to be the ideal treatment modality that could be used, however, it was associated with the following complications : i) large burns required autogenous donor area of a large size which was often not feasible, ii) patients in shock due to burns could not be subjected to surgery, and iii) the procedure itself would leave a raw area at the donor site. In view of these problems, various workers tried to cover the burn areas in an attempt to produce and hasten their healing.

Regarding wounds, the qualities required for a safe dressing material to be used in burns can be taken as follows :

- i) it must be non-toxic in case it is absorbable,
- ii) it must be water soluble so that heat loss due to vaporisation is minimal,
- iii) it must possess antiseptic property,

- iv) it must not be injurious to viable tissue cells over wounds nor should it interfere with proliferation of epidermis or taking up of skin grafts,
- v) resistant pathogens should not develop during its use,
- vi) it should be easily and readily procurable and durable,
- vii) it must be inexpensive,
- viii) its application and removal should be easy.

To fulfil the above criteria, various materials were suggested by different workers. Biological coverings as heterogenous skin grafts, collagen sheets, fetal membranes and synthetic substances as various films, fibrics, foams and laminates have been used. Studies on the use of resin oil emulsion, amniotic membrane and Povidone-iodine plus Neosporin powder as coverage materials have been carried out at our institution with beneficial results. Povidone-iodine plus neosporin powder have been found to show better results in terms of average healing time, but were found to be associated with pain and sometimes hypergranulation and local allergic reactions. Simultaneously, many a cases showed tendency to improve and heal well after simple cleaning with sterile solutions without using any covering,

if the direct contamination of the wound was kept away with adequate care.

This prompted us to undertake this study to see and compare the effects of simple cleaning of burn wounds with sterile saline solution and Betadine-Neosporin dressings in similar cases, re-evaluating the latter and chalking out a profile of comparison between the two.

#### AIMS OF STUDY

1. To study the effects of isolated simple cleaning, done daily, of burn wounds on their healing.
2. To study and to re-evaluate the effect of covering the burn wounds with Povidone-iodine plus Neosporin powder.
3. To compare the results of simple daily cleaning of burn wounds with those treated by Betadine-Neosporin dressings in terms of effects on healing.

\*\*\*\*\*

REVIEW OF LITERATURE

## REVIEW OF LITERATURE

Despite the rapid strides of advancement that the medical sciences have undertaken, the problem of management of burns remains a complex one and still poses a potential threat to life. With ongoing industrialisation, thermal injuries have assumed greater importance due to increasing frequency and complexity. The management of a case of burns comprises two parts - (1) General management viz., maintenance of airway, intravenous resuscitation, analgesics, sedation, tetanus prophylaxis and antibiotics, (2) Management of local wounds. The present day management of burns is the outcome of ideas, observations and experience of various workers. There are two methods much prevalent for the treatment of burns -

### Exposure method :

The principle is that drying the wound inhibits the growth of bacteria and ultraviolet light is hostile to bacterial growth. Eventually a dry surface is obtained and topical agents may be applied as a further deterrent to bacterial growth.

Closed method :

The underlying principle is that majority of burns are sterile or contain no pathogenic organisms on their surface in the first few hours. If the area can be sealed off from the surroundings by means of sterile dressings, infection can be checked.

The literature regarding treatment of burns dates back to as old as 1500 B.C. when there is mention of Papyrus who used cowdung application topically to treat burns.

Ancient Indian literature reveals that Sushruta used a mixture of butter with red achro or the bark of a fig tree. He also debrided severe burns with loose skin and flesh.

Around the 5th or 6th centuries B.C., the Egyptians were making use of incineration and a mixture of gum, goat's hair and milk from a lady who gave birth to a male child. Extracts made from tea leaves and tinctures were being employed for a similar cause in 430 B.C. by the Chinese and the Japanese.

In ancient Rome, three methods were in practice - Celsus suggested a mixture of honey and bran, exposure method was suggested by Pliny and Elder while Galen suggested local application of vinegar or wine over the burn surfaces.

Paulus of Aegina used various emollient preparations in the 7th century A.D. Rhazes (980-923 A.D.) used white lead and oils of rose and wax, and also ice cold water locally. Surgery had no place in burn management apart from the excision of contracted scars as described by Celsus.

Ambrose Pare (1517-1590) gave the concept of use of ointments for the treatment of burns. Claw (1591) used 5 different complex preparations on different parts of the body affected by burns. Vinegar and chalk poultices were used locally by David Cleghorn (1792). That ice cold water could relieve pain and prevent or minimise oedema formation was suggested by Sir James Earle in 1799. Syme in 1827 described the use of dry cotton wool dressing applied with firm pressure.

Hippocrates, the father of Medicine, used resins and bitumen mixed with melted swine seam spread over a piece of cloth on the burn surface after warming. He also used warm vinegar soaked dressings to relieve pain. Later, he used a solution of oat bark for tanning of the burns.

The father of German surgery, Gailhetmus Febricus Hildanus in 1607 described 3 degrees of burns according to depth while Heister (1683-1758) classified burns into four degrees according to depth and including time factor.

Boyer (1814) classified burns into 3 degrees -  
(i) erythema, (ii) blisters leading to superficial ulcers,  
and (iii) eschar.

Dupuytren (1932) classified burns into 5 degrees  
according to depth of involved tissue -

- i) Erythema or superficial ecchymosis which blanches  
on pressure.
- ii) Cutaneous inflammation with loss of epidermis  
and vesicle formation.
- iii) The destruction of a portion of the papillary  
body.
- iv) The disorganisation of whole dermis to a  
subcutaneous cellular tissue.
- v) The formation of eschars of all the carbonisation  
of the whole thickness of the burnt part.

He also described the 4 periods during the natural  
course of burn injury -

- i) Period of irritation,
- ii) Period of inflammation,
- iii) Period of suppuration,
- iv) Period of exhaustion.

Simultaneously he also gave description of gastro-  
intestinal hemorrhage in cases of burns. Later Curling

(1842) recognised gastric and duodenal ulceration as the cause of the hemorrhage in burn cases.

The dry method of dressing received prime attention and usage in the period between 1833-1868. This method had been already in use in the British Isles prior to 1833. Syme (1834) in his book 'Principles of Surgery' described that the dry method was superior clearly to the application of carron oil and linimentum aqua calcis.

The exposure method for the management of burns was put into use by Copeland in 1871. The followers of Lister started applying his antiseptic techniques to burns. 2.5% carbolic acid in oil was used to soak the lint applied to the burn wound and the dressings were changed on alternate days. This met with some undesirable effects. Local gangrene resulted in many cases and partial thickness burns were converted into full thickness ones. Absorption of the compound through the burn area led to symptoms and signs of phenol poisoning.

The period ranging from the year 1885 and 1910 was the era in which saline wet dressings were in great use. Wet dressings of sodium bicarbonate were first applied to the burn surface followed by picric or boric acid. Picric acid poisoning was reported in several cases by E.J. Elliot (1906). The systemic absorption of boric acids also caused many undesirable side effects as rashes,

desquamation of skin, restlessness, confusion and weakness, hypothermia, hypotension, tachycardia, loss of hair and renal damage.

Wax dressings were in high recommendation between 1910 to 1926. Wax contains 25 mg% B-naphthol and it was used for application warm at a temperature of 50 to 60°C. B-naphthol however produced the very undesirable side effects like hepatic and renal damage, convulsions and sometimes death.

The idea of application of Tannic acid to burn surfaces which was put forth by Daxitson in 1894 was soon discarded owing to the fatal hepatic degeneration and conversion of initial partial thickness burn to full thickness that were associated with such therapy. Aldridge (1933) advised the use of gentian violet as an escharotic agent.

Moving to the recent era we see the use of petroleum gauze piece locally over burn wounds which was done during World War II by Allen & Koch in 1942.

The exposure method of treating burns was elaborately described and put into practice by Wallace of Edinburgh (1949) in Britain and Pulaki Artzi & Blocker of U.S.A. in 1950. Later on, many a surgeons followed suit in adopting this method with a view that development

of crust provided physiological covering of the burn surface, thus reducing the effects of a raw area.

Ludbug, Reiss & Artzi (1953) focussed on the fact that the primary cause of death due to burns was septicaemia and staphylococci were the main offenders.

With the advent of potent antibiotics, sepsis due to the much resistant organism *Pseudomonas* became more common and deaths were attributed to it. It was the gram negative organisms and some other microbials that led to the search and subsequent development of antimicrobial agents that could penetrate the burn surface to combat these organisms. 0.5% Silver nitrate (Mayer), Cerium nitrate (Williams W. Monafo), Silver sulfadiazine (Fox, 1975; Stenford, 1969) were tried and continue to be in use. However, these are effective only in controlling the growth of the organisms. From an average of  $10^7$  micro-organisms per gram of tissue the number was reduced to  $10^4$  per gram by these agents.

0.5% Silver nitrate were shown to produce beneficial effects on the healing of burns but such therapy was associated with certain dangers. Metal toxicity, depletion of body salts and necrobiosis were seen. The dangers of sodium chloride depletion are so immediate that the dressings should not be used without very frequent monitoring of sodium chloride and bicarbonate concentrations.

Silver sulfadiazine was used as application on burn surfaces with the following advantages -

1. Quick penetration into eschar.
2. Eschar does not adhere to the dressing.
3. Silver ions are released from the preparation slowly and the concentrations are toxic to pathogens. Silver ions combine with sulfhydryl carboxyl phosphate and other biologically active groups. Such interaction involves proteins and often cause its precipitation. Silver ions act on the cell surface of bacteria and cause its death by causing drastic alteration of cell membrane characteristics. This drug inhibits nearly all pathogenic bacteria and fungi and also exerts a prominent action against *Pseudomonas* (Rosenkraz, 1972).

On the other hand, the disadvantages associated with the use of Silver sulfadiazine are -

1. The absorption of the compound can cause crystalluria.
2. Bacterial resistance to the sulfonamides may occur with the use of this compound.
3. Side effects of burning, rash, itching can occur.
4. The drug is expensive.

This was followed by the era of use of biological dressings. If a functional skin substitute and a reliable skin tissue culture technique would become available some day, the treatment of burn injuries would change overnight. Eschar would be excised early in post-burn period and covered with a skin substitute. Within a week or two the patient was fit for discharge. About a month later, small pieces of autologous healthy skin grown in tissue culture would be used to replace this. In the coming period this method may well become a reality.

The ideal properties of a skin substitute can be taken as follows -

1. It must adhere rapidly and strongly enough with the underlying raw areas.
2. It should possess water vapour transfer properties like normal skin.
3. It should have enough elasticity to stretch freely over the joints.
4. It should be reasonably durable.
5. It should serve as an intact bacterial barrier.
6. It should be non-antigenic and non-toxic.
7. It should possess antiseptic properties.
8. It should have homeostatic properties.
9. Its application as well as removal should be easy.
10. It should be cheap.

The materials used for the purpose of treating burns which are used as skin substitute include -

1. Biologic

a) Human allograft (Homograft)

Living donor

Cadaveric donor fresh

Cadaveric donor frozen

Amniotic membrane

b) Xenograft (Heterograft)

Living donor fresh

Frozen radiated or dried

c) Tissue derivatives

Collagen sheet fabric or sponge

Bioplast fibrin

2. Synthetic

Solid silicon polymer membrane

Other plastics

Microporous materials

3. Composite materials

Surface membrane (Silicone, Microporous, trydron, adherent substrate.

Collagen, cotton gauze, synthetic polymer sponge, vetour, flecking or fabric.

### Biological dressings :

Homografts - It was Polbeck (1871) who first applied the first homograft to a burn patient. In 1881, Girdner treated a lightning burn patient with skin from a suicide victim. In the same year, Shede used skin from an amputation specimen as well as from cadavers within 24 hours. The use of fetal skin as homograft on burn surface owing to its more energetic vitality was stressed by Ivunova in 1890.

Temporary homografts were used over II and III degree burns by James O'Neill Jr. in 1967. This was found to be of distinct benefit following eschar separation. Sharma et al (1978) have reported similar results.

Allograft skin though being satisfactory biological materials have their own limitations. The number of cadavers suitable for skin donation are limited and the cost of procuring and applying cadaveric homografts is high.

Amniotic Membrane - The amnion or the inner fetal membrane has an inner surface in contact with fetus and fluids while the outer surface is separated from the uterus by decidua. The amniotic membrane has the following parts :

1. Placental amnion-lines the inner aspect of the placenta.
2. Reflected amnion-lines the rest of the chorion.
3. Dependent amnion-overlies the internal os of the cervix.

Histologically 5 layers are identifiable : Epithelium, basement membrane, compact layer, fibroblast layer and sponge layer. The following effects of amniotic membrane dressing were observed by Pigeon in 1960 :

(A) Immediate effects :

1. Pain was relieved at once and analgesics were not required.
2. Antibiotics were required only after complications developed.
3. The dressings were generally found dry.
4. Healing was quick and complete.

(B) Delayed effects :

1. No discoloration of the skin was seen.
2. The scar tissue formation was minimal.
3. No contractures were observed.

Xenografts - These came into use owing to the limitations associated with homografts. Burleson and Tavis showed that the adherence of xenografts and allografts was similar. Heterografts provide a readily available, easily stored and sterilised dressing in comparison to homografts.

In 1960, canine skin was used by Switzer et al. Porcine skin is the xenograft material of choice, however, pig skin has been used by Brombay et al & Elliot and Hochn.

Variable results were reported from early re-epithelialisation to conversion to full thickness burn with skin loss. Salisbury (1973) reported some poor results in the form of increased inflammation and delayed repair following treatment. Immediate and lasting relief from pain was a striking feature with the use of porcine grafts. Xenograft has most of the properties of an ideal skin substitute. A viable xenograft is antigenic but the dead one is not. The major problem with the use of xenografts is the propensity to digestion by wound collagenase and subsequent infection.

Collagen sheet - Collagen, a fibrous protein is distributed in various animal tissues like skin, muscle etc. When implanted in living animal tissues in pure form it does not invoke any antigenic reaction. Collagen sheets are derived from serous and sub-serous layers of freshly slaughtered cattle intestine. These are available in 4" x 6" size and packed in cylindrical glass tubes containing ethylene oxide which acts as the sterilising agent.

Sinha (1972), Shanker (1975) and Gupta et al (1976) used collagen sheets as primary layer material in the management of burns. Gupta & Chaturvedi (1974) used it to cover donor areas. Thukral & Gupta (1976) have used collagen material in the repair of hernia and to cover surgical defects. Elhans et al (1978) used sheets as

biological dressing and reported its role in prevention of infection and increasing rate of healing. Similar findings were reported by Jain et al in 1976 also.

The effects that the collagen sheets produce include : prevention of airborne infection, minimisation of fluid loss, and promotion of formation of healthy and pink granulation tissue. However, it is an expensive material and is not available at every centre.

Synthetic material : It was Pickrell in 1942 who worked on sulfonamide film. Many of the synthetic materials adhere by entrapment of coagulum, in the interstices of the material. Silicon polymer membrane is the best available material because it is elastic, durable and its water vapor characteristics can be controlled by varying its thickness. Kornberg et al (1977) used thin silicon membrane bound to cotton gauze for temporary substitution of skin. But this lacked elasticity and the pattern of adherence was not uniform either. Other materials include modified polyvinyl chloride or similar plastics which provide more elasticity and water vapor transfer characteristics (James et al, 1975; Fowsend, 1977). These materials seem to of promise as temporary skin substitutes and short term applications. The disadvantages of biological dressings despite of the fact that they are best dressing material for burns are :

1. Subgraft suppuration.
2. Limited supply in case of autograft and others.
3. High cost.
4. Lympholised allograft skin shows less adherence to the wound, undergoes dermal-epidermal separation after application to the wound with subsequent destruction of the exposed dermis.
5. Possible transmission of disease like hepatitis in case of allograft.

Increasing importance is now being gained by the problem of burn wound infection. The inability on the part of systemic therapy to control local sepsis has led to the use of many treatment modalities aimed at this problem, e.g. topical ointments (Fox, C.L.; Stanford, W., 1969), early surgery i.e. escharotomy or skin grafting (Burke, J.F.; Bandoc, C.C. and Quinby, W.C., 1974) or amniotic membrane application (Bose, 1979).

Topical therapy has led to a considerable reduction in the rate of sepsis. We must consider the properties that an ideal topical drug should have. The desirable properties of such a drug can be summarised as follows (Zellner, P.R. and Buggi, S., 1985) :

1. It must be non-toxic.
2. It must have antiseptic properties or a good antimicrobial spectrum.

3. It must not kill viable tissue nor harm the surviving and proliferating tissue.
4. It must penetrate the eschar.
5. It must be non-antigenic.
6. It must have tanning effect.
7. It must be inexpensive.
8. Its application and removal, both, should be easy.
9. It should be durable.
10. It should be easily procurable.

In order to establish these criteria, a number of newer techniques were evolved. These have their own merits and demerits.

Out of these, Povidone-iodine is an agent quite suitable for the treatment of burns. However, it lacks the ability to actively penetrate burn tissue which is quite a disadvantage. Povidone-iodine can be applied locally with ease alone or with Ascarbine (Kock, D.M., 1985). PVP is active against a wide variety of gram positive and negative organisms as well as fungi, but it causes pain on application and excessive drying of eschar (Schwartz, Sheris & Spencer, 1988). Prolonged use may affect the thyroid (Buer, M. and Riceabona, 1985).

On the other hand, Neosporin powder (Burroughs Wellcome) with the ingredients of Neomycin sulfate,

Zinc Bacitracin and Polymyxin B can also be used to treat burns. It is locally acting bactericidal drug having adverse effects as otonephro-toxicity and to a certain extent the depression of the respiratory system. This combination can well be presumed to act as an excellent adjuvant to the use of Povidone-iodine. Beneficial and encouraging results were observed with the use of a combination of povidone-iodine plus neosporin powder by Sinha et al (1988).

The microbial ecology of burn wounds of the patients of burns changes from time to time and alterations in flora occur as a series of minor epidemics with a succession of predominant organisms.

In view of the wide spectrum of organisms affecting burn wounds a topical agent with a wide spectrum of coverage is obviously desirable. FVP with Neosporin may prove ideal for this purpose.

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MATERIAL AND METHODS

## MATERIAL AND METHODS

The present study was concluded at M.L.B. Medical College Hospital, Jhansi, from 2.2.1990 to 1.2.1991, to evaluate the effects of simple cleaning of burn wounds with sterile saline solution and, Povidone-iodine plus Neosporin powder dressings and to compare the results obtained by these two methods.

Sterile saline solution : was used to clean the wounds daily. 0.9% sodium chloride coming in wards for intravenous infusion was used.

Neosporin powder : is available in powder form, 10 gm packs. This contains the following ingredients :

- i) Polymyxin-B-sulfate : 5000 U B.P. per gm.
- ii) Zinc Bacitracin : 4000 U B.P. per gm.
- iii) Neomycin sulfate : 3400 U B.P. per gm.

Betadine lotion : This is available in 10% Povidone-iodine form. One container of Betadine lotion contains 100 ml.

### Selection of cases :

All the cases with superficial and deep burns upto 60% of body surface area who were admitted to the

Emergency ward of the hospital within 7 days of the thermal injury were included in this study irrespective of their age, sex, socio-economic status, contamination of wound and mode of injury.

Method of study :

All the cases were subjected to detailed interrogation to elicit the history and then thorough general and local examination. These were recorded on a standard proforma sheet prepared for this study which is attached.

History : Introduction : Name, age, sex, occupation, rural/urban, date of admission and discharge and time of healing.

Regarding the burn accident :

- Date and time of burn (duration of burn)
- Place of accident and nature of work at the time of accident,
- Cause of the burn,
- Prior treatment received (if any),
- Symptoms.

Physical examination :

General : The cases were examined to see for pulse, blood pressure, temperature, respiration and hydration and for general condition as a whole.

Local Examination : Burn wounds were elaborated in terms of percentage of burn, depth of burn and contamination.

- a) Percentage of burn was calculated by Wallace's 'Rule of Nine' in cases of adults and, Lund & Browder chart in cases of children.
- b) Depth of burn (superficial/deep) - a hypodermic needle was used to test the burn sensation. If the area had increased sensitivity, it was taken as superficial or partial thickness burn. The area of diminished or absent pain sensitivity was taken as deep or full thickness burn. If the hair could be pulled out easily and painlessly from the burn area, it was taken as a III degree, and if not, as a II degree burn.
- c) Contamination of burn wound : The burn areas were graded for contamination as follows -
  - i) Apparently clean : No contamination of foreign body, clean intact blisters.
  - ii) Mild contamination : Slight contamination, ruptured blisters, open wounds.
  - iii) Gross contamination : Heavy contamination with dirty cloth, foreign body and/or medical substances i.e. cow-dung, mud etc.

d) Area involved : Diagrammatic representation in anterior, posterior and lateral views was done as shown in the attached proforma.

In addition, the help of the following criteria was also sought :

Classification of depth	Appearance of burn area	Pain sensation
I degree	Erythematous	Painful and hyperesthetic.
II degree A	Blisters with reddened base and moisture	Painful and hyperesthetic.
II degree B	Blisters with blanched base and moisture	Painful, hyperesthetic or anaesthetic at places.
III degree	Leathery pale or pearly white or charred dry	Painless and anaesthetic.

#### Resuscitation and general management :

Prior to starting local management, patients were resuscitated and general treatment was made available to every patient (viz. intravenous infusion, blood and plasma infusion, analgesics, antibiotics and tetanus prophylaxis). A swab was taken from the burn surface for culture and sensitivity testing.

Local management of the wound :

Patients were divided into two groups -

Group A : Only simple cleaning was done daily. The burn areas were gently debrided, necrosed skin and blisters were removed. The burn areas were then cleaned with 0.5% savlon. This was followed by thorough washing with sterile saline (0.9% sodium chloride) solution. Spirit was applied over the adjacent skin and margins of the burn area. This process was repeated as and when required.

Group B : Neosporin powder was sprinkled over the burn area till a uniform coating was obtained. Then betadine lotion was applied in drops over this till a thick yellow crust was formed over the burn areas. In deep wounds, Betadine was injected by hypodermic needle in subescharotic spaces.

Assessment of the results : This was done by interview with patients, examination - general and local, and investigations.

Interview : The patient was asked about -

1. Pain and discomfort (mild, moderate or severe),
2. Fever,
3. Any evidence of allergy as itching, rashes, nausea or vomiting.

Physical examination :

General : Case was seen for pulse, blood pressure, temperature, respiration, hydration and general condition.

Local : The following were observed :

1. Presence of discharge and soakage.
2. Appearance of burn area in terms of healing and tendency to heal.
3. Collection of pus, if any. In case when present culture and sensitivity was done.
4. Epithelialisation of the wound.
5. Total duration of healing.

Investigations :

1. Routine : Blood - complete hemogram, TLC, DLC, Hb gm%,  
E.S.R.

Urine - Gross (Albumin, sugar) and microscopic.

2. Culture and sensitivity testing for pus if present.

# PROFORMA

M.R.D. No.

Name \_\_\_\_\_

Age/Sex

Occupation

Rural/Urban

### Address

Date and time  
of admission

Date and time  
of discharge

Group

Total time of  
healing

## HISTORY

- i) Date and time of burn
- ii) Place of work and nature of work at the time of burn
- iii) Cause of burn
- iv) Prior treatment (if any)

## SYMPTOMS

- i) Pain
- ii) Burning
- iii) Blisters
- iv) Fever
- v) Oliguria
- vi) Discharge from wound surface
- vii) Difficulty in swallowing or in inspiration
- viii) Any other

## PHYSICAL EXAMINATION

- a) General examination at time of admission
- |               |             |        |
|---------------|-------------|--------|
| - G.C.        | - Pulse     | - B.P. |
| - Temperature | - Hydration |        |



Days	Wound cleaned daily with Normal Saline (0.9% Sodium chloride)										Wound dressed with PVP + Neosporin as and when required									
	1	4	7	12	14	21	30	45	50	60	1	4	7	12	14	21	30	45	50	60

Pain

Soakage

Mobility

Bi dressing  
Changes :

(a) Surface

(b) Margins

(c) Thickness

(d) Lusture

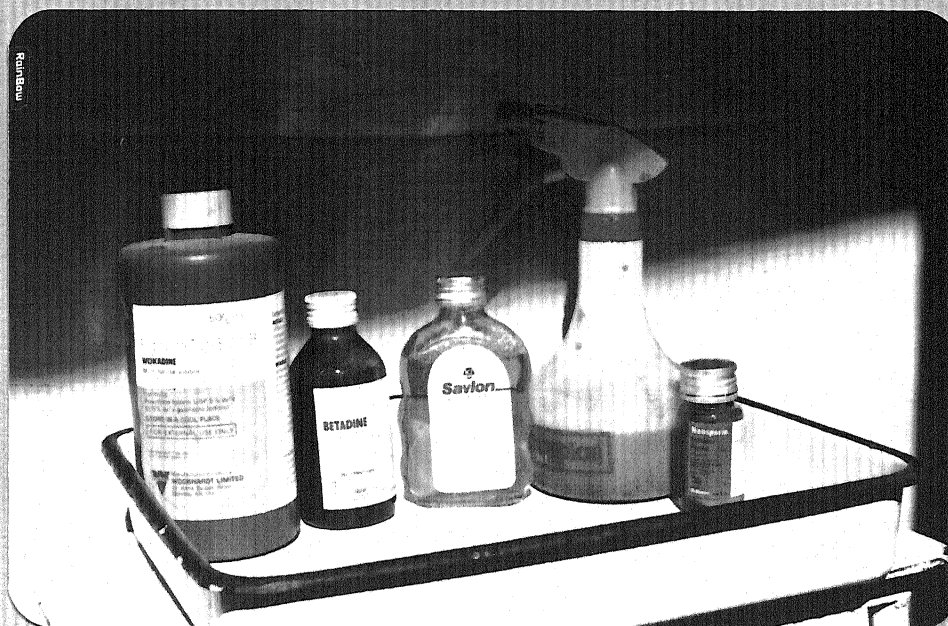
(e) Colour

(f) Dryness

(g) Adherence

Healed on

Time in healing



Photograph - 1

Showing Materials used in the work.  
(0.9% Saline available in the Ward  
for I/V infusion was also used).

OBSERVATIONS

### OBSERVATIONS

The present study comprises of 42 cases of superficial and deep burns admitted in the Emergency and surgical wards of M.L.B. Medical College Hospital, Jhansi. The duration of study ranged from 2.2.1990 to 1.2.1991. The patients were divided into two groups matched by age and percentage of burn.

One group comprising of 18 patients was treated with simple cleaning with saline daily and the other group of 24 patients was treated with combination of Povidone-iodine plus Neosporin powder.

The age-wise distribution of the burn cases is given below :

Table I

#### Age incidence

Sl. No.	Age group in years	No.of cases	Percentage
1.	0 - 15	4	9.52
2.	16 - 30	29	69.00
3.	31 - 45	7	16.60
4.	46 - 60	2	4.76
5.	Above 60	0	-

Most of the cases were young and the majority was under the age of 30 years. 33 patients out of 42 were under 30 years. As much as 69% cases belonged to the age group between 16-30 years and a view of the data indicates that burn incidence was maximum in the third decade of life.

The following table indicates the sex distribution of our cases :

Table II

Sex distribution

Sl. No.	Age group (years)	Male		Female		Total	
		No.	%	No.	%	No.	%
1.	0 - 15	-	-	4	9.5	4	9.52
2.	16 - 30	6	14.3	23	54.7	29	69.00
3.	31 - 45	2	4.6	5	11.9	7	16.60
4.	46 - 60	1	2.3	1	2.38	2	4.76
5.	Above 60	-	-	-	-	-	-

Maximum incidence of burns was seen in middle age group females. 23 female patients out of 33 belonged to the age group 16-30 years. In males of similar age group the incidence was again maximum (14.3%) but smaller as compared to females. The higher incidence of females

could be attributed to involvement in cooking and use of kerosine otherwise as in lamps etc.

In our study, most of the burn cases came from rural areas, the incidence in urban and rural areas is tabulated below :

Table III

Rural-Urban incidence.

Sl. No.	Area	Incidence (No. of cases)	Percentage
1.	Rural	36	85.7
2.	Urban	6	14.3

The higher incidence in rural areas may again be attributable to greater use of kerosine in villages as compared to urban areas where cooking gas and electricity are available.

Most of the burns were sustained indoors as the following table depicts :

Table IVLocation of burn accident

Sl. No.	Location of burn accident	Male	Female	Total (Percentage)
1.	Indoor	6	29	83.3
2.	Outdoor	3	4	16.7

Most of the burns were sustained inside the house as cooking and scalding were the prime modes of injury. In the outdoor, electric burns were seen.

The relation between occupation and burns can be visualised from the following table :

Table V

Sl. No.	Occupation	No. of cases
1.	Housewife	30
2.	Student	6
3.	Electrician	1
4.	Farmer	3
5.	Labourer	2

Among the females the majority were housewives and sustained burns due to kerosine while cooking or due to hot water or milk by scalding. One male got burn due to electricity and this was related to his profession. Five of the males were either farmers or labourers and fire or scalding were the main cause of burn injury.

The cause of the burns among the males and females separately are listed below :

Table VI

Sl. No.	Cause of the burn accident	Male	Female
1.	Fire during work or cooking	4	25
2.	Lamp	1	5
3.	Scalding	3	3
4.	Electricity	1	-

The cases of burns taken for this study were those which had arrived at the hospital within 7 days of the thermal injury. The following table depicts the time that had elapsed before the patients sought medical attention.

Table VIITime interval between burn accident and hospital arrival.

<u>Sl. No.</u>	<u>Duration in hours</u>	<u>No. of cases</u>
1.	0 - 24	18
2.	24 - 48	12
3.	48 - 72	5
4.	72 - 120	6
5.	120 - 168	1

The majority of cases were seen within 2 days of the burn accident. However, certain patients delayed seeking medical attention beyond this period.

The percentage of burns in our cases which we studied can be tabulated as follows :

Table VIIIPercentage of burns

<u>Sl. No.</u>	<u>Percentage of burns</u>	<u>No. of cases</u>	<u>Percentage</u>
1.	0 - 10	6	14.2
2.	11 - 20	8	19.0
3.	21 - 30	16	38.0
4.	31 - 40	10	23.8
5.	41 - 50	1	2.3
6.	51 - 60	1	2.3

The depth of the burns sustained were as follows :

Table IX

Sl. No.	Percentage of burns	Superficial	Deep	Mixed
1.	0 - 10	4	1	1
2.	11 - 20	5	2	1
3.	21 - 30	7	4	5
4.	31 - 40	2	6	2
5.	41 - 50	-	-	1
6.	51 - 60	-	-	1

The surface culture reports revealed the growth of organisms as under :

Table X

Sl. No.	Bacterial growth	No. of cases
1.	Staphylococcus	28
2.	Pseudomonas	7
3.	Mixed Gram positive & negative	4
4.	None	3

The grades of contamination of burn wounds were found as under :

Table XI

Sl. No.	Grade of contamination	No. of cases
1.	Apparently clean	10
2.	Mild contamination	24
3.	Gross contamination	8

18 patients were treated by daily simple cleaning and 24 patients were treated with Povidone-iodine plus Neosporin. The responses obtained with the use of these forms of therapy is depicted in the tables to follow.

Table XII

Response of superficial burns to simple cleaning done daily

Sl. No.	Rate of healing (days)	Percentage of burns						Total
		0-10	11-20	21-30	31-40	41-50	51-60	
1.	0 - 15	2	2	-	-	-	-	4
2.	16 - 30	-	1	2	-	-	-	3
3.	31 - 45	-	-	2	1	-	-	3
4.	46 - 60	-	-	-	-	-	-	-
5.	Above 60	-	-	-	-	-	-	-

Table XIIIResponse of superficial burns to Povidone-iodine plus Neosporin

Sl. No.	Rate of healing (days)	Percentage of burns						Total
		0-10	11-20	21-30	31-40	41-50	51-60	
1.	0 - 15	2	1	-	-	-	-	3
2.	16 - 30	-	1	1	-	-	-	2
3.	31 - 45	-	-	2	1	-	-	3
4.	46-- 60	-	-	-	-	-	-	-
5.	Above 60	-	-	-	-	-	-	-

Table XIVResponse to treatment with simple cleaning in case of deep and mixed burns

Sl. No.	Rate of healing (days)	Percentage of burns						Total
		0-10	11-20	21-30	31-40	41-50	51-60	
1.	0 - 15	1	-	-	-	-	-	1
2.	16 - 30	-	1	1	1	-	-	3
3.	31 - 45	-	-	2	2	-	-	4
4.	46 - 60	-	-	-	-	-	-	-
5.	Above 60	-	-	-	-	-	-	-

Table XV

Response to treatment with Povidone-iodine plus Neosporin  
in cases of deep and mixed burns

Sl. No.	Rate of healing (days)	Percentage of burns						Total
		0-10	11-20	21-30	31-40	41-50	51-60	
1.	0 - 15	1	1	1	-	-	-	3
2.	16 - 30	-	1	3	2	-	-	6
3.	31 - 45	-	-	2	3	1	1	7
4.	46 - 60	-	-	-	-	-	-	-
5.	Above 60	-	-	-	-	-	-	-

As already noted, 39 out of the 42 cases studied were showing some kind of infection. All the cases of deep burns were infected. The bacterial counts showed the following values after 14 and 29 days of treatment.

Table XVI

Bacterial counts after treatment

Sl. No.	Bacterial count	Treatment			
		Simple cleaning		PVP + Neosporin	
		15th day	30th day	15th day	30th day
1.	Sterile	3 (16%)	9 (50%)	5 (21%)	13 (54%)
2.	$< 10^5/\text{cm}^2$	2 (11%)	2 (11%)	4 (16%)	4 (16%)
3.	$> 10^5/\text{cm}^2$	7 (39%)	7 (39%)	6 (25.2%)	6 (25.2%)

Table XVII

Table showing the incidence of soakage and pus formation after treatment with simple cleaning and PVP plus Neosporin.

Sl. No.	Treatment given	Total wounds	Soakage	Pus
1.	Simple cleaning	18	5	2
2.	PVP plus Neosporin	24	6	3

\*\*\*\*\*



Photograph - 2

Showing Betadine-Neosporin Dressing  
in deep burn of a thirty years old  
male.



Photograph - 3

Showing complete healing of the  
same patient (Photograph 2) on  
40th day.



Photograph - 4

Showing healing in case of superficial & deep (mixed) burn on 24th day after daily simple cleaning with Normal Saline.



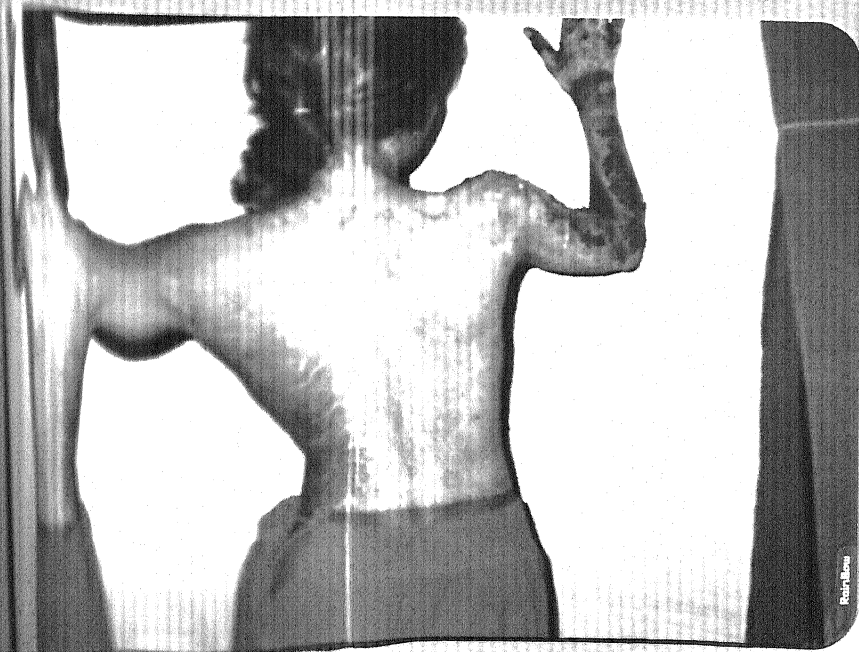
Photograph - 5

Showing complete healing in the same patient (Photograph 4) on 30th day.



Photograph - 4

showing healing in case of superficial  
(second degree) burn on 24th day after  
thorough cleaning with Normal



Photograph - 5

showing healing in the same  
Photograph 4) on 30th day.



Photograph - 6

Showing healing in case of superficial burn on the 15th day after daily simple cleaning with Normal Saline.



Photograph - 7

Showing complete healing in the same patient (Photograph 6) on the 20th day.

8



9



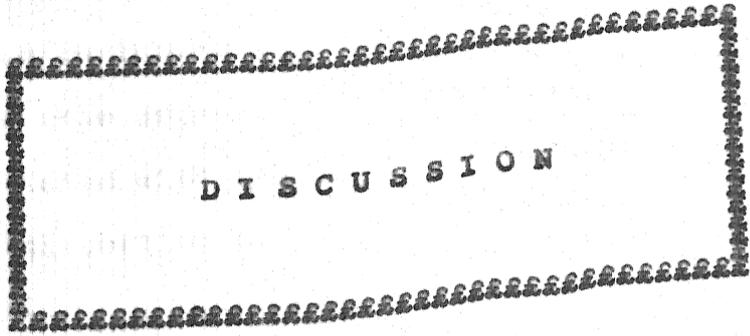
Photographs- 8 & 9

Showing complete healing in case of  
superficial burn after daily simple  
cleaning with Normal Saline on the  
24th day.



Photograph - 11

Showing complete healing of leg in the same patient (Photograph 10) on 20th day after daily simple cleaning with Normal Saline.



DISCUSSION

### DISCUSSION

Burns are notorious in the sense that they break the continuity of skin and produce greater raw area. Burns are ischaemic wounds. Confluent thrombosis which involves arterioles, capillaries, venules, and at times, even larger vessels, is characteristic of fine thickness burns. In partial thickness burns thrombosis is incomplete, the dermal circulation in deeper, viable segment of the dermis is gradually re-established within a few days, although the deep superficial portion of the dermis of course remains avascular.

Because of wound ischaemia only, systemically administered antimicrobial agents are not reliably delivered to the site where they are needed, as diffusion from the wound periphery, for a variable but often considerable distance is their only means of access, moreover the wound surface close to the heat source is at once the most severely injured and ischaemic and as well the original site of most burn wound infections. Topical therapy (daily cleaning with sterile 0.9% sodium chloride or topical agents) is therefore best used to treat burn.

Burn wounds in patients with large burns is equally as urgent a need as is fluid resuscitation.

Normal skin harbours few pathogenic bacteria. Most burns are sterile initially, although contamination usually by soil or water or dirty linen may occur after accident. Because of the greater raw area burn wounds are more prone to invasion by micro-organisms. In large burn areas; dense colonization of pathogens can occur within 24 hours in untreated patients. Immediately after injury, few bacteria can be recovered predominantly gram positive. The type and density of organisms present in the untreated burn wounds change with time, so that by the fifth post burn day *Pseudomonas* can be recovered. By the middle of second post burn week, the burn wound organisms are predominantly gram negative. By using only systemic antimicrobials without any topical therapy, the organisms penetrate the eschar by migration and extend down to viable non-viable tissue interface. At this site further microbial proliferation commonly occurs and promotes lysis of denatured collagen and spontaneous slough of eschar.

Therefore, the main aim in the treatment of burn is to re-establish the continuity of the skin by preventing the infection. Endogenous skin grafting is the best dressing material discovered so far but it has its own limitations as in extensive burns large amount of donor

area may not be available (50% full thickness burn in adult and of skin required to obtain wound closure has been estimated at 6000 square centimeters). Patients may be unfit for surgery due to shock and other reasons.

Alternatively homografts are used but again due to limited supply, other biological covering materials used are allografts skin, heterograft skin, foetal membrane. Although they are not cost effective but the problem is of very limited supply.

Thus if simple daily cleaning with sterile 0.9% saline alone is instituted, this may save the patients from the unnecessary expenditure of buying the costly drugs because cost is also an important factor.

Presently Povidon-Iodine with Neosporin powder are in as a topical antimicrobial agents in the treatment of burn. The present work is a study of the effects of Betadine-Neosporin dressings and simple daily cleaning with saline in superficial, deep and mixed burns.

A total number of 42 cases of burns were studied. These were divided into 2 groups. One group comprising of 18 patients of which 10 had superficial burns and 8 deep, was treated with daily simple cleaning with normal saline. The other group of 24 patients of which 8 had superficial and 16 deep burns.

The incidence of burns was highest in the age group of 16-30 years. This may be attributed to the fact that this was the age group which comprised the young housewives as well as the active working population. The majority of the cases were females, a fact due to most of the patients being housewives and actively involved in kitchen work and hence having contact with kerosine oil used in stoves and firewood. Most of the cases came from the rural area. With modernisation, cooking gas used by urban people, places a much reduced hazard of burns. Since most of the burns were sustained during cooking or lighting kerosine lamps, the burns in most of our cases (83.3%) were sustained indoors. Obviously, as far as the occupation is concerned, most of the females were housewives, and fire during work or cooking was thus the commonest cause of burns. Most of the cases landed-up in the hospital in about 2 days of the thermal injury and most had been left untreated. Most of the cases had 21-40% burns.

Nearly all the cases of burns had not received any kind of medical attention and had not been taken care of in any way. Infection was thus present in 39 out of 42 cases on surface culture. Staphylococci were the commonest offending organism followed by Pseudomonas.

The response of superficial burns to simple daily cleaning with saline was promising. 40% of the

burns had healed by the 15th day. In case of the superficial burns treated by PVP plus Neosporin, 37.5% had healed in this time. At one month, 70% of the superficial burns had healed in case of saline treated cases while 62.5% cases of the other group had healed. By 45 days healing was complete in all the cases in either group. Thus we can see that in case of superficial burns the responses after using the two kinds of treatment were comparable. This fact is important since we can infer from this fact that PVP plus Neosporin may not have additional benefit in superficial burns. Thus, if simple daily cleaning with saline alone is instituted, this may save the patients from the unnecessary expense of buying the relatively expensive drugs, and cost as we all know is a very important factor as far as the poor population of our country is concerned.

Table : Showing percentage of healed patients having both superficial and deep burns during 0-45 days.

Total time of healing in days	Simple cleaning with Normal saline		PVP + Neosporin treated cases	
	Superficial	Deep & mixed	Superficial	Deep & mixed
15	40.0%	12.5%	37.5%	25.0%
30	70.0%	50.0%	62.5%	56.25%
45	100.0%		100.0%	

In case of deep and mixed burns, 12.5% cases were showing good healing by 15 days in cases treated with saline, while in the PVP + Neosporin group, the figure was 25%. At one month, 50% of saline treated cases had healed while 56.25% of the other group had healed. The rate of healing was superior in the drug treated cases. 27% of patients treated with saline had counts less than  $10^5/\text{cm}^2$  while the corresponding figure in the PVP + Neosporin group was 37%, after 15 days of treatment. Similarly, at the end of 30 days, as much as 39% cases treated with saline were having counts greater than  $10^5/\text{cm}^2$ , but only 25% of the PVP + Neosporin group had such elevated counts.

From these facts we can conclude that in cases of deep and mixed type of burns PVP + Neosporin had a greater role to play. The average healing time was shorter and the infection rate was lower as compared to the saline group. Also, since much more cases of deep burns were treated with PVP + Neosporin and since the rate of infection was higher in the cases kept in this group, the response can be assertively said to be superior in cases of deep burns treated by these drugs. Daily simple cleaning plus systemic antibiotics may not be able to control local infection effectively, owing to presence of necrosed or dying tissue, which is very unsuitable for penetration of systemic drugs, and this

may be the factor causing this somewhat lesser response. Presence of infection at local site will obviously delay healing. On the other hand, PVP + Neosporin by way of being a potent antibacterial combination, can be visualised to have controlled infection better in the same conditions, and this factor may have well been the cause of better healing rates.

As noted in table XVII, the overall incidence of soakage and pus formation was comparable in the two groups. However, recalling that more cases of deep burns which were comparatively more infected and complicated reflects on the fact that PVP + Neosporin does effectively combat infection and reduces soakage and pus formation consequently.

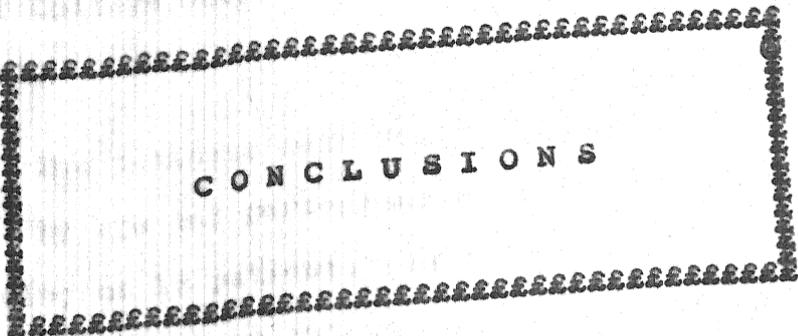
In conclusion, we can infer that in cases of superficial burns daily simple cleaning has an important role to play. Daily simple cleaning tends to keep the wound clean and thus ward off infection effectively. Control of infection helps to achieve the desired healing of the burn. In case of superficial burns PVP + Neosporin may not have an additional role to play. The application of these drugs will add to the cost of the treatment without any additional benefit. Only in cases where we find that the infection is severe, as reflected by bacterial counts, may it be of benefit to use this combination. Superficial burns otherwise may

well be expected to heal nicely with daily simple cleaning with normal saline and systemic antibiotic coverage which is given in all cases, whether treated with saline or any other method.

In case of deep burns control of infection is better with PVP + Neosporin and saline cleaning alone although it may achieve healing, it is relatively delayed. The incidence of soakage and pus formation may also tend to be higher. It may thus be advisable to use PVP + Neosporin dressing in such cases as compared to daily cleaning with saline.

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CONCLUSIONS

### CONCLUSIONS

The comparative effects of Povidone-Iodine with Neosporin powder application and daily simple cleaning with 0.9% saline were studied and compared in 42 cases of superficial and deep burns. At the same time effects of both were assessed. This study was conducted in the Emergency and surgical wards of M.L.B. Medical College Hospital, Jhansi, from 2.2.1990 to 1.2.1991.

The patients were divided into two groups matched by age and percentage of burn. One group comprising of 18 patients was treated by daily simple cleaning with saline and the other group of 24 patients was treated with combination of Povidone iodine plus Neosporin powder.

The study was conducted in the patients of superficial, deep and mixed burns upto 60% of body area involvement.

The conclusion drawn are as follows :

1. Patients are more sufferer in the age group of 16-30 years. 69% patients belonged to this age group. Out of this, the percentage of female patients in this age group was 54.7, while males were 14.3%.

2. Most burn accidents took place in indoor activity and the ratio of indoor and outdoor were 83.3% and 16.7%.
3. Maximum burn injuries occurred in rural areas and the ratio of rural Vs urban were 85.7% and 14.3%.
4. Most of the burns are thermal in nature and in majority of cases the cause of burn was fire during cooking.
5. Patients with major burn reach directly to hospital much earlier than those with minor burns and most of the cases landed up in hospital in about two days of the thermal injury.
6. Infection was present in 39 out of 42 cases on surface culture. Staphylococci were the commonest offending organisms followed by Pseudomonas.
7. The scars of completely healed areas were brownish flat margin in cases treated with daily simple cleaning with saline and more fibrous in Povidone-Iodine with Neosporin powder application.

On comparing the effects of two methods to assess the superiority of each, following conclusions were drawn -

1. Both the methods, simple daily cleaning with saline and Povidone-Iodine plus Neosporin dressing are easy in application.

2. 0.9% sodium chloride solution (Normal saline) should be sterile.
3. The response of superficial burn to simple daily cleaning with saline is promising and PVP + Neosporin may not have additional benefit in superficial burns. So this may save the patients from the unnecessary expense of buying the relatively expensive drugs. This is very important factor as far as the poor population is concerned.
4. In cases of deep and mixed burns, the rate of healing was definitely superior in the drug treated cases. The average healing time was shorter and the infection rate was lower as compared to the saline group.

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S U M M A R Y

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## S U M M A R Y

Man suffered from burn injuries since he began using fire. Burn therapy began at man's first adverse encounter with it. The widely empiric remedies were conceived in ignorance and of course were excusable.

Fortunately, enough knowledge is now available to permit a rational evaluation of agents currently available or newly proposed for the treatment of burn.

A topical agent should be antiseptic, non-antigenic, non-toxic systemically or locally. It should minimise the vaporisational heat loss and of course should be of low cost.

While waiting for the future technique of skin culture growing on a medium and then doing skin grafting at present there is still lot of scope for search of an ideal dressing material for burn wound. The present work was undertaken and designed to evaluate the role of daily simple cleaning with 0.9% normal saline and Neosporin-Betadine dressings in cases of burn.

Forty two patients were kept in the study. Out of 42 cases, 33 were females and 9 were males.

Majority of them belonged to younger age groups. 9.52% were under the age of 15 years. As much as 69% cases belonged to the age group between 16-30 years and 16.6% patients belonged to the age group between 31-45 years.

Major cause of burn appeared due to thermal injury. In our study, most of the burn cases were from rural areas. 85.7% cases belong to rural areas and only 14.3% belonged to urban areas.

83.3% burns were sustained inside the house and only 16.7% cases were in the outdoor. Among the females, the majority were housewives and sustained burns due to kerosene while cooking.

Cases were divided into 2 groups. One group comprising of 18 patients, of which 10 had superficial burns and 8 deep, were treated with daily simple cleaning with normal saline. The other group of 24 patients, of which 8 had superficial and 16 deep burns was treated with Betadine-Neosporin dressings.

All the cases with superficial and deep burns upto 60% of body surface area who were admitted within 7 days of the thermal injury were included in this study irrespective of their age, sex, socio-economic status, contamination of wound and mode of injury.

In all cases, patients were observed for pus formation, control of infection, rate of healing and quality of scar.

In one group, only simple cleaning was done daily. The burn areas were gently debrided, necrosed skin and blisters were removed. The burn areas then cleaned with 0.5% Savlon. This was followed by thorough washing with sterile saline (0.9% sodium chloride) solution. Spirit was applied over the adjacent skin. This process was repeated as and when required.

In other group, Neosporin powder was sprinkled over the burn area till a uniform coating was obtained. The Betadine lotion was applied in drops over this till a thick yellow crust was formed over the burn areas. In deep wounds, betadine was injected by hypodermic needle in subescharotic spaces. The response of superior burns to simple daily cleaning was promising and good. 40% of burns had healed by the 15th day. In case of the superficial burns treated by FVP plus Neosporine, 37.5% had healed in this time. At one month, 70% of the superficial burns had healed in case of saline treated cases while 62.5% cases of the other group had healed. By 45 days, healing was complete in all the cases in either groups.

In case of deep mixed burns percentage of cases showing good healing was superior in the drug treated cases.

In these cases FVP + Neosporine had a greater role of play. The average healing time was shorter and the infection rate was lower.

Bacterial counts were lower in FVP + Neosporine group. FVP + Neosporine does effectively combat infection and reduces soakage and pus formation in comparison to simple cleaning with saline. Comparing the FVP+Neosporin dressings with daily simple cleaning with normal saline.

It was concluded that -

1. In cases of superficial burns daily simple cleaning has an important role to play and FVP + Neosporin may not have an <sup>additional role to play.</sup> application of these drugs will add to the cost of the treatment without any additional benefit.
2. In case of deep burns, control of infection is better with FVP + Neosporin. By saline cleaning alone, healing can be achieved but it is relatively delayed. The incidence of soakage and pus may also tend to be higher. It may thus be advisable to use FVP + Neosporin dressings in deep and infected cases as compared to daily cleaning with saline.

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